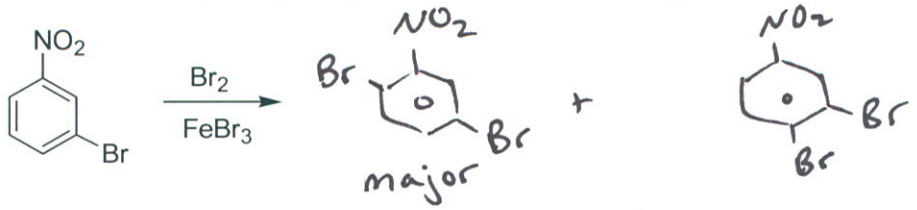
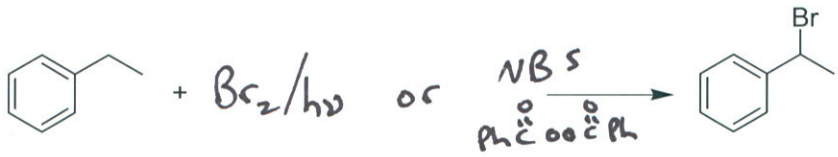
1. Provide the major organic products for the following reactions.

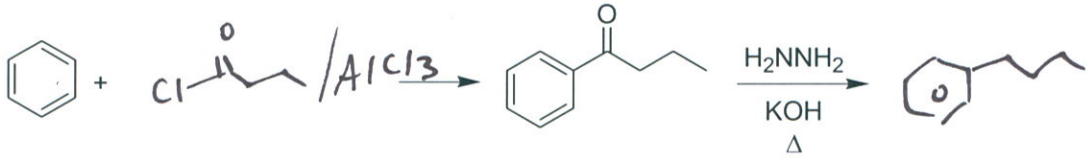


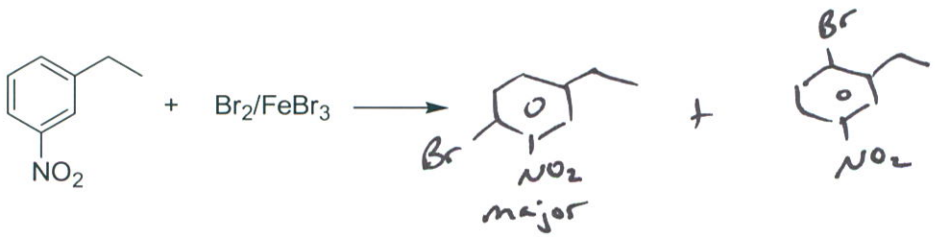


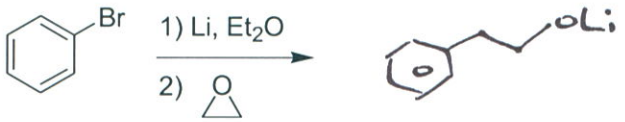


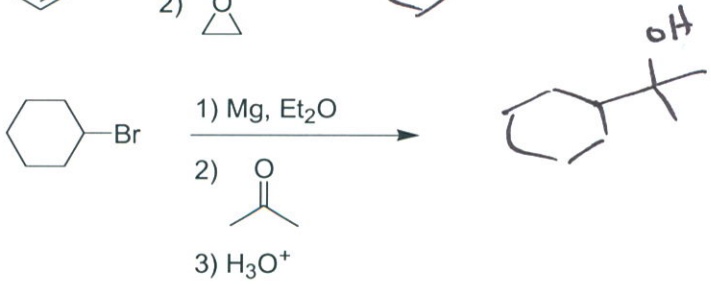


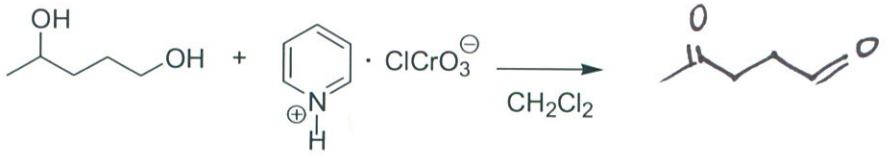


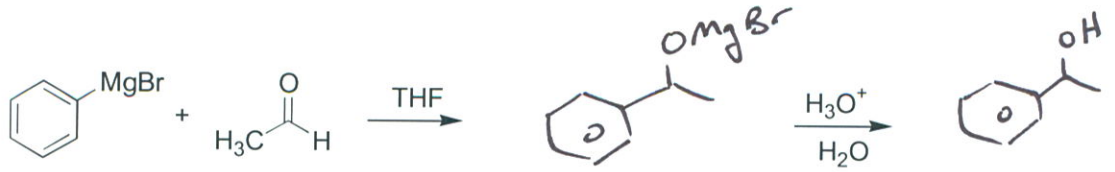


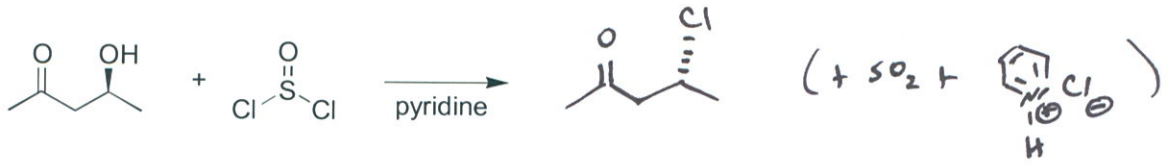


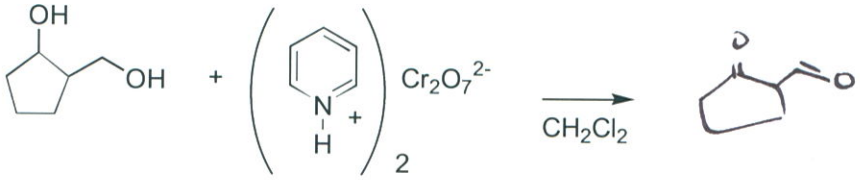


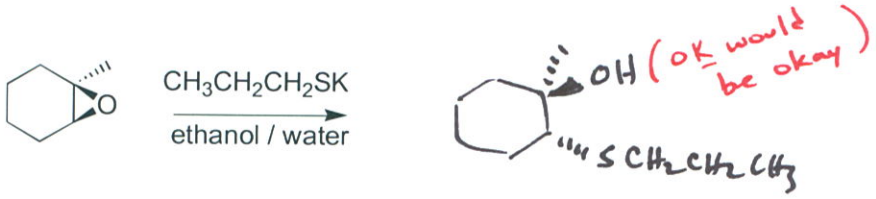



OH
OH
+
· ClCrO3
CH2Cl2

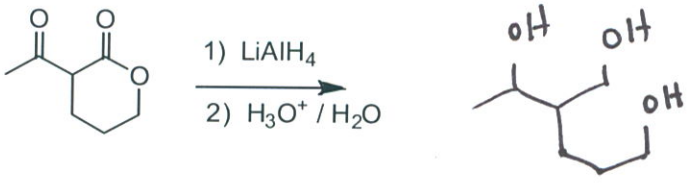

MgBr
+
H3C
H
THF
OMgBr
H3O+
H2O
OH

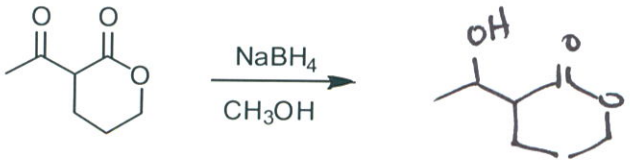

O
OH
+
Cl
S
Cl
pyridine
Cl
(+ SO2 +
Cl
H)


OH
OH
+
N
H
+
Cr2O7 2-
2
CH2Cl2

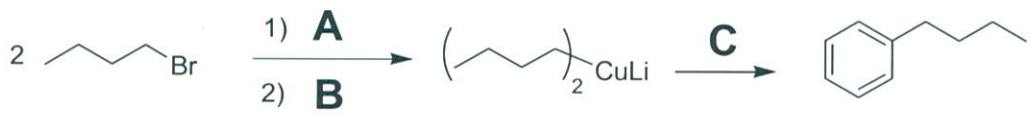

CH3CH2CH2SK
ethanol / water
OH
(OK would be okay)
SCH2CH2CH3

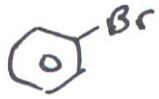

OH
Br
NaOH
H2O
(+ H2O + NaBr)


1) LiAlH4
2) H3O+ / H2O
OH
OH
OH

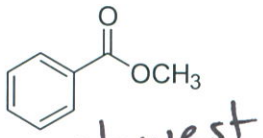

NaBH4
CH3OH
OH

2. (6 points) What are the missing reagents A-C in the following reaction sequence?

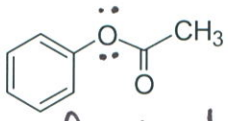


A) Li B) CuI C) 

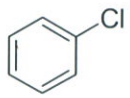
3. (3 points) Rank the following aromatic compounds by rate of reaction for electrophilic aromatic substitution. Clearly indicate which compound reacts the fastest.



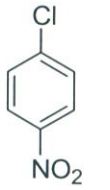
slowest

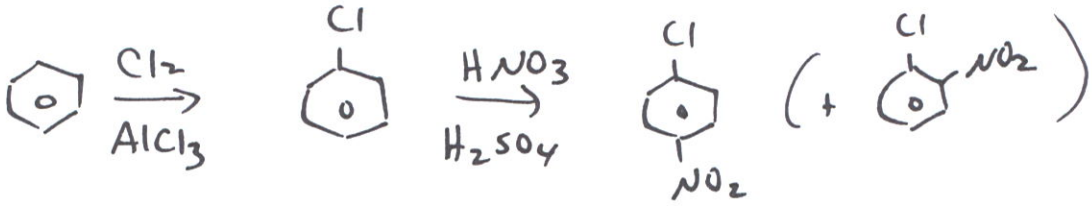


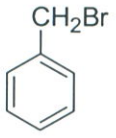
fastest

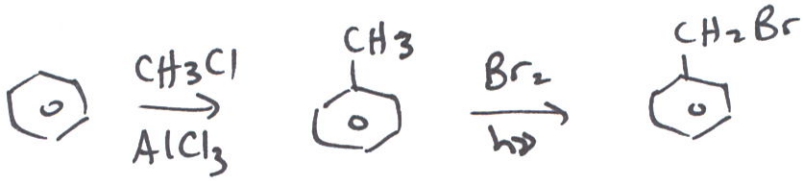


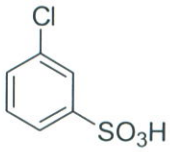
4. (8each, 16points) Provide a synthesis for each of the following compounds from benzene. You may use any additional reagents you wish. More than one step may be necessary.

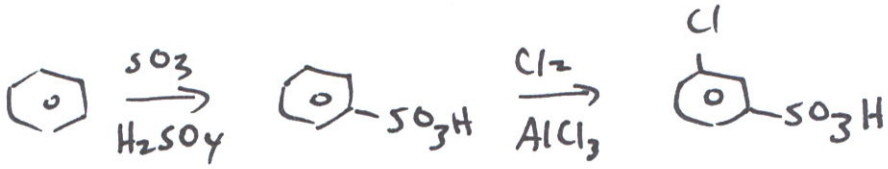


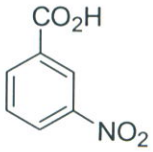


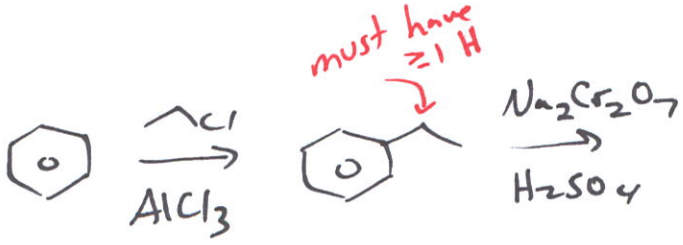


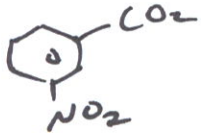






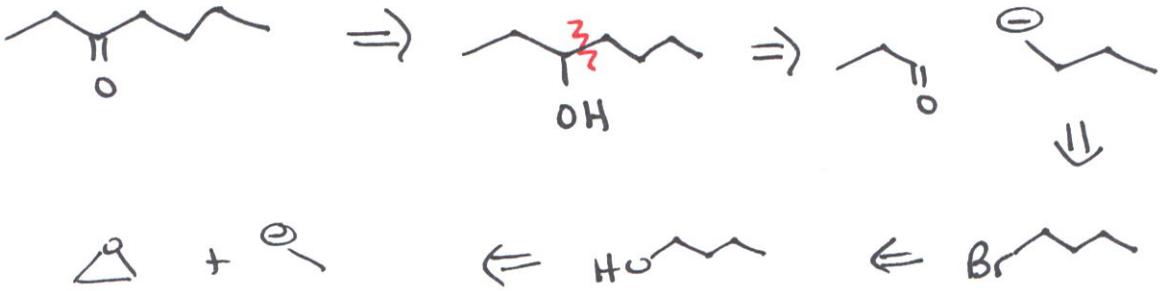




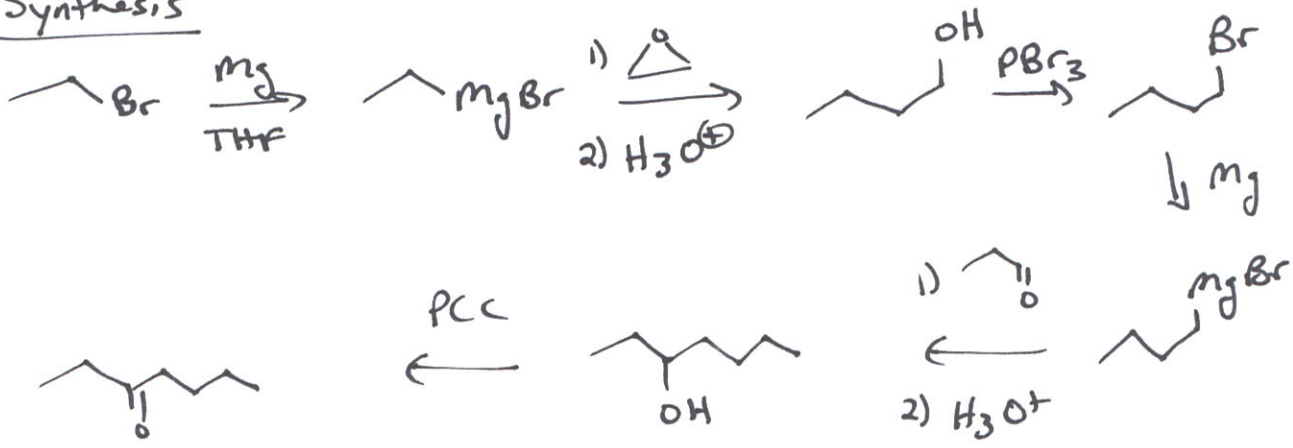


3-heptanone

Retrosynthetic Analysis

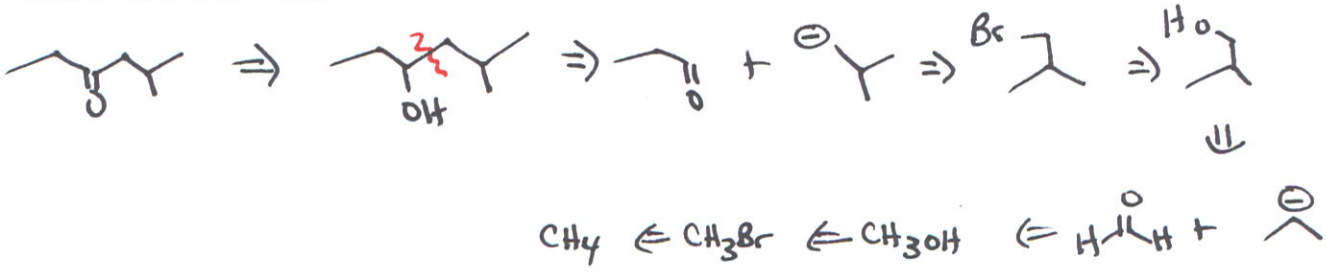


Synthesis



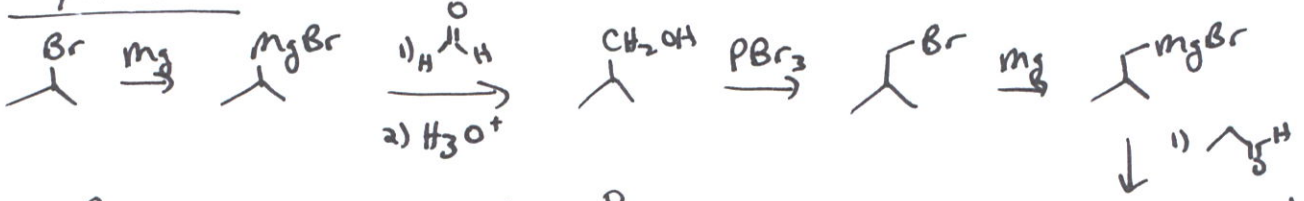
5-methyl-3-hexanone

Retrosynthesis I



$CH_4 \Leftarrow CH_3Br \Leftarrow CH_3OH \Leftarrow$

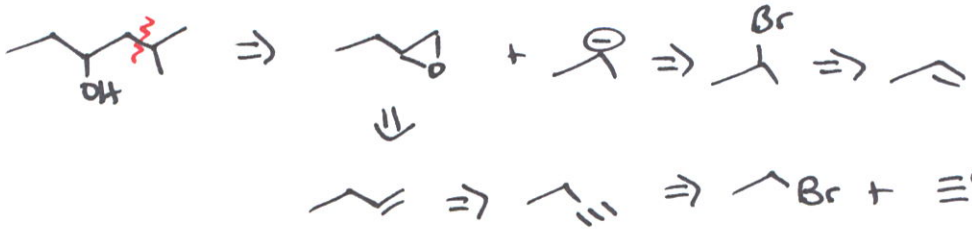
Synthesis I



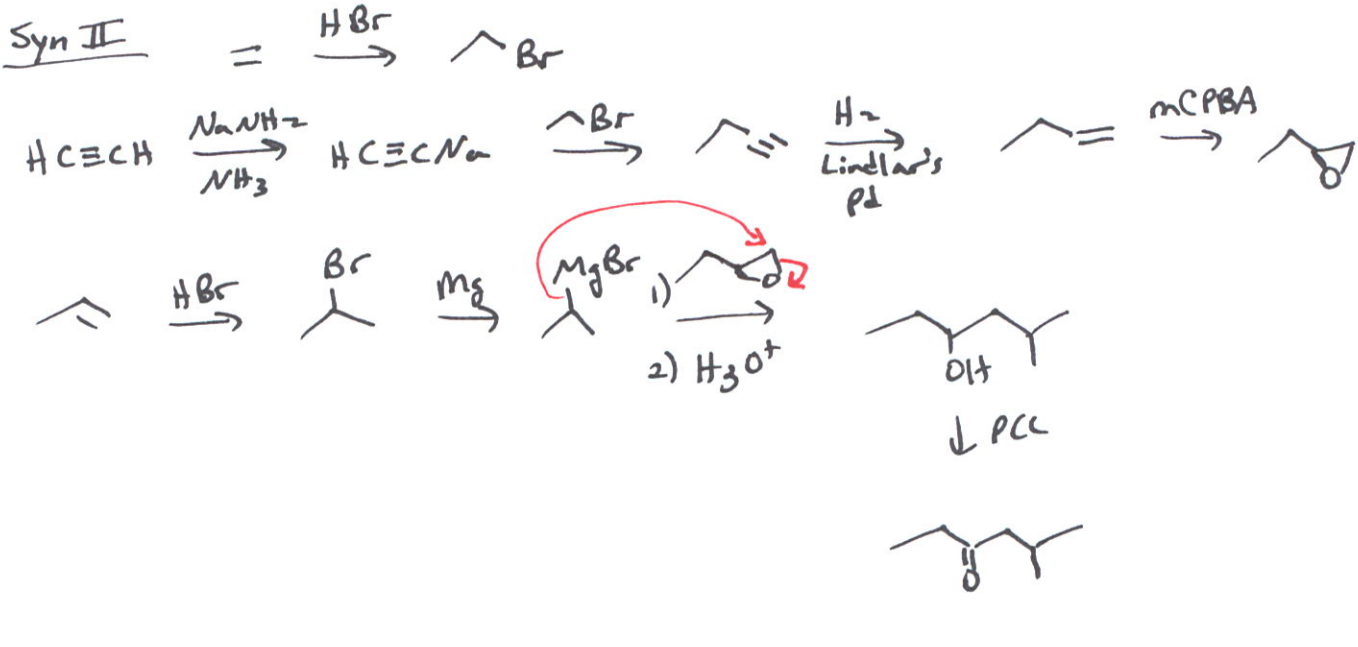
$CH_4 \xrightarrow[h\nu]{Br_2} CH_3Br \xrightarrow{NaOH} CH_3OH \xrightarrow{PCC}$ 



Retro II

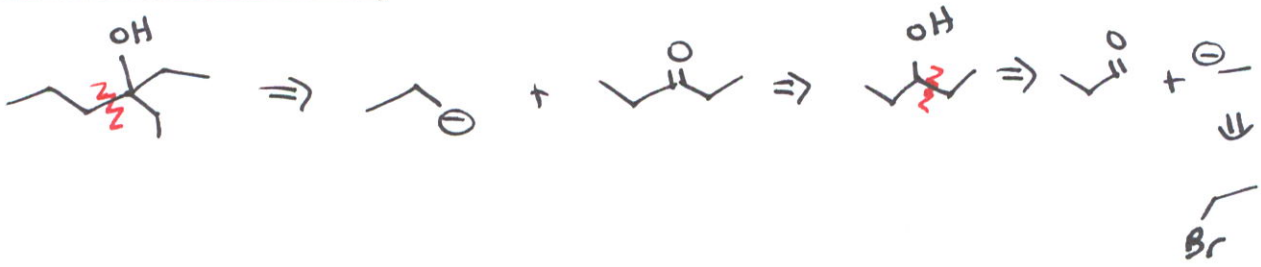


Syn II

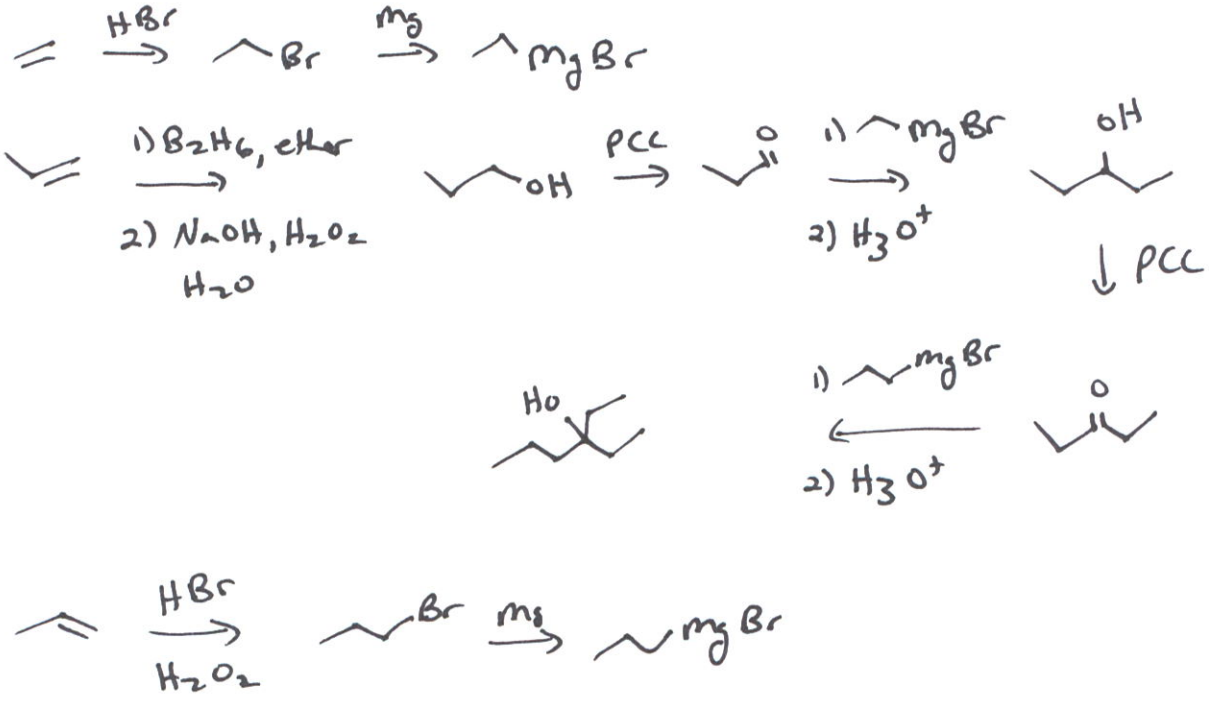


3-ethyl-3-hexanol

Retrosynthetic Analysis



Synthesis



5. (10 points) Provide a reasonable synthesis of 3-heptanone. You may use any organic reagents of <u>three carbons or less</u> and any inorganic reagents you need. If you choose to use organometallic reagents, show how they would be synthesized.

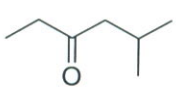
See attached

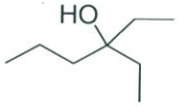
6. (6 points) Briefly explain why the Williamson ether synthesis is a better method for preparing ethyl propyl ether than the acid-catalyzed condensation of alcohols.





7. (20 points, 10 each) Provide a reasonable synthesis for the following compounds. You may use any organic reagents of <u>three carbons or less</u> and any inorganic reagents you need. If you choose to use organometallic reagents, show how they would be synthesized. (Could you do it from hydrocarbons?)





See attached

8. Provide a complete electron-pushing mechanism for the following reaction.

